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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,818	04/27/2001	Marshall H. Mendelsohn	S-92,235	2816

7590 03/26/2003

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EXAMINER

LISH, PETER J

ART UNIT	PAPER NUMBER
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1754

DATE MAILED: 03/26/2003

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/842,818

Applicant(s)

MENDELSON ET AL.

Examiner

Peter J Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 27 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 2,4-6,10,12,13 and 17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,7-9,11,14-16 and 18-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

Claims 11 and 21 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 'limitations' are drawn toward inherent properties of the claimed invention; therefore these claims do not further limit the invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 20 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Bosch et al. (USPN 1,029,528).

Bosch et al. disclose a process for the absorption of nitrogen oxides. According to the process of Bosch et al., the absorption of oxides of nitrogen is effected by introducing a suspension of an absorbent, such as the hydroxides and carbonates of the alkaline earth metals, into the gas mixture in a state of fine division, for instance as a spray or mist (column 1, lines 22-45). Bosch et al. do not specifically teach that a portion of the liquid suspension is vaporized, however, it is expected that due to the high temperatures of nitrogen oxide containing flue gas,

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this will be the case. Alternatively, it would have been obvious to one of ordinary skill at the time of invention to use the process of Bosch et al. to treat a flue gas containing nitrogen oxides that enters at a temperature sufficient to vaporize a portion of the absorbent suspension. No difference is seen in the reaction of Bosch et al. and that of the instant application.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 7, 9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caldwell et al. (USPN 6,447,740).

Caldwell et al. disclose a process for the removal of contaminants such as mercury, SO₂, NO, NO₂, and H₂S from a flue gas stream. The process comprises contacting the flue gas stream with chlorine in gaseous state at a temperature greater than 100 °C and at a sufficient time to form an oxidized form of the contaminants, the oxidized form being more readily removable from the flue gas stream. In regards to claim 11, Caldwell et al. disclose that the presence of NO_x in the flue gas enhances the capture of mercury (column 3, lines 25-32).

Caldwell et al. disclose the use of gaseous chlorine because even when a liquid chlorine solution is used in place of a gaseous chlorine oxidizing agent, the reaction takes place in the gas phase because practically all of the chlorine (90%) is swept out of the solution and into the gas phase (column 2, lines 35-55). Caldwell et al., however, fail to disclose the step of "vaporizing a solution containing an oxidizing agent". It would have been obvious to one of ordinary skill at

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the time of invention to vaporize an aqueous solution containing chlorine in the process of Caldwell et al. in order to obtain the gaseous chlorine, which is the desired state form of the oxidizing agent in the process of Caldwell et al.

Regarding the limitation that the concentration of the oxidizing agent in the aqueous solution is within a specific range, examiner notes that this is only pertinent to the instant invention in that it is effectively equivalent to the concentration of the oxidizing agent in the resulting vapor. Regarding the concentration of the oxidizing agent in the vapor, Caldwell et al. teach that the higher the chlorine concentration, the higher the oxidation conversion of mercury (column 2, lines 36-40). Therefore, the selection of a specific range of chlorine concentrations is viewed to be the optimization of a known process, which could have been found through routine experimentation, and is held to be obvious under *In re Boesch* (205 USPQ 215).

Claims 1, 3, 8, 14-16, 18-19, 21-24, and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caldwell et al. as applied to claims 7, 9, and 11 above, and further in view of Mendelsohn et al. (USPN 5,900,042).

Regarding claim 14, Caldwell teaches that after the oxidation treatment, the oxidized flue gas is scrubbed with water of pH less than or equal to 7 followed by the addition of alkali metal iodide salt to precipitate mercuric iodide from the solution. Caldwell does not teach the removal of the water-soluble compounds using aqueous scrubbers employing alkaline moieties.

Mendelsohn et al., however, teach a similar process wherein a flue gas containing mercury, NO, NO₂, SO₂, etc. is oxidized by a chlorine solution. The oxidized flue gas then travels to a wet scrubber, where the water-soluble mercuric compounds and other constituents are treated with

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aqueous solutions of calcium hydroxide, sodium carbonate, and sodium hydroxide to remove the soluble compounds. It would have been obvious to one of ordinary skill at the time of invention to substitute the process of removing the soluble mercury compounds of Mendelsohn et al. for the scrubbing and precipitation using alkali iodide process of Caldwell et al. in order to achieve a one step removal of the soluble compounds.

Regarding claims 16 and 19, Caldwell et al. teach that the higher the chlorine concentration, the higher the oxidation conversion of mercury (column 2, lines 36-40). Therefore, the selection of a specific range of chlorine to mercury or chlorine to flue gas ratios is viewed to be the optimization of a known process, which could have been found through routine experimentation, and is held to be obvious under *In re Boesch* (205 USPQ 215).

Regarding claim 18, the specific concentrations of the components in the initial flue gas of Caldwell et al. are not specifically taught. It would have been obvious to one of ordinary skill at the time of invention to perform the oxidation and removal process on any flue gas in which the mercury and NO_x concentrations were deemed to be hazardous, regardless of the concentration of SO₂.

Regarding claims 1, 8, 15, 23-24, 26, and 30, Caldwell et al. disclose that gaseous chlorine oxidizing agents are preferred. Mendelsohn et al. teach the spraying of a mist of a chloric acid or chloric acid with an alkali metal chlorate oxidizing solution into the flue gas. It would have been obvious to one of ordinary skill at the time of invention to vaporize the chloric acid oxidizing solutions of Mendlesohn et al. for use in the process of Caldwell et al. in order to obtain the desired gaseous form of the oxidizing agent.

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Regarding claim 27, the temperature at which the aqueous solution containing the chlorine oxidizing agent is vaporized is not specifically taught. However, it would have been obvious to one of ordinary skill to vaporize the solution by heating it to any temperature sufficient to effect vaporization, such as 400 – 500 °C, by any conventional means, such as a heat exchanger.

Regarding claim 28, the specific contact pattern of the flue gas and the oxidizing vapor of Caldwell et al. is not specifically taught. However, because it is well known that gaseous reactions may occur by contacting the gases in a counter-current flow pattern, it would have been obvious to one of ordinary skill at the time of invention to do so.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Caldwell et al. taken with Mendelsohn et al. as applied to claim 14 above, and further in view of Senjo et al. (USPN 4,035,470).

Caldwell et al. teach that the use of chlorine to oxidize SO_x and NO_x in a flue gas also results in the conversion of the metallic mercury to mercuric chloride (column 3, lines 26-29). Caldwell et al. does not teach the use of chlorine dioxide to achieve this oxidation. Senjo et al., however, teach a similar process wherein SO_x and NO_x are removed from waste gases by adding chlorine dioxide to oxidize NO to NO_2 and by scrubbing the waste gas with an aqueous scrubbing solution. It would have been obvious to one of ordinary skill at the time of invention to use chlorine dioxide gas, as taught by Senjo et al., in the process of Caldwell et al. in order to effect the oxidation treatment.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5,328,673 to Kaczur et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 703-308-1772. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-305-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

PL
March 17, 2003



**STUART L. HENDRICKSON
PRIMARY EXAMINER**